

What is claimed is:

1. A disposable solid test strip capable of enabling a person to self-monitor fat loss on a daily basis in a fluid sample of urine, saliva, or sweat or other bodily fluid by providing a color signal, a photochemical signal or an electrochemical signal indicative of at least the β -hydroxybutyrate content of the sample upon being dipped in said sample, removed, allowed to rest briefly and then read.
2. A disposable solid test strip according to Claim 1 wherein the color, photochemical signal or electrochemical signal is indicative of the combined β -hydroxybutyrate and acetoacetate content of the sample.
3. A disposable solid test strip according to Claim 1 wherein the color, photochemical signal or electrochemical signal is indicative of the content of total ketone bodies present in the sample.
4. A solid test strip according to Claim 1 which comprises
 - 1) an inert support layer and
 - 2) a dried reagent layer comprising a porous material impregnated with
 - a) β -hydroxybutyrate dehydrogenase enzyme (“ β -HBD”)
 - b) nicotinamide adenine dinucleotide (“NAD”),
 - c) a tetrazolium dye precursor

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 - d) an electron mediator capable of transferring an electron to said dye precursor to effect a color change and
 - e) a sufficient quantity of a buffer having a pH of from about 8.6 to about 9.5 to maintain the reaction pH at a level between about 8.6 and about 9.5 when the strip is saturated with a sample of bodily fluid.
5. A solid test strip according to Claim 4 in which the β -HBD enzyme is obtained from *Alcaligenes* or another source which contains β -HBD that is not inhibited by chloride ions and is present in an amount of from about 0.2 to about 5.0 U per strip.
 6. A solid test strip according to Claim 4 wherein the tetrazolium dye precursor is nitrobluetetrazolium (“NBT”) or 2-(indophenyl)-3-(paranitrophenyl)-5-phenyl tetrazolium chloride (“INT”).
 7. A solid test strip according to Claim 4 wherein the β -hydroxybutyrate is from a source that is inhibited by chloride ions and is present in an amount per strip from about 1 to about 100 U per strip.
 8. A solid test strip according to Claim 4 wherein the electron mediator is a diaphorase enzyme.

9. A test strip according to Claim 2 which is comprised of
 - 1) a inert support layer, and
 - 2) a dried reagent layer comprising a porous material impregnated with:
 - a) β -HBD enzyme
 - b) NAD
 - c) a tetrazolium dye precursor,
 - d) an electron mediator capable of transferring an electron to said dye precursor to effect a color change and
 - e) a sufficient quantity of a buffer having a pH between about 7.0 and about 8.3 to maintain the reaction pH between about 7.0 and about 8.3 when the strip is saturated with sample.
10. A test strip according to claim 9 wherein the β -BHD is obtained from *Alcaligenes* or another source found to produce β -HBD that is uninhibited by chloride ions and is present in an amount of from about 0.2 to about 5.0 U per strip.
11. A test strip according to claim 9 wherein the β -HBD is obtained from a source such that it is inhibited by chloride ions, and it is present in an amount per strip from about 1 to about 100 U per strip.
12. A test strip according to Claim 9 wherein the tetrazolium dye precursor is NBT or INT.

13. A test strip according to Claim 9 wherein the electron mediator is a diaphorase enzyme.
14. A test strip according to Claim 2 comprising:
 - 1) an inert support layer and
 - 2) a dried reagent layer comprising a porous material impregnated with:
 - a) NAD,
 - b) β -HBD,
 - c) a nitroprusside salt or a diazonium salt in a quantity sufficient to react with endogenous acetoacetate in the sample and acetoacetate obtained by conversion thereto of β -hydroxybutyrate in the sample,
 - d) a tetrazolium dye precursor ,
 - e) an electron mediator,
 - f) and a sufficient quantity of a buffer having a pH from about 8.6 to about 9.5 to maintain the strip at a level pH of about 8.6 to about 9.5 when saturated with sample.
15. A test strip according to Claim 14 wherein the β -HBD is from a source selected from among *Alcaligenes* and others capable of producing β -HBD that is uninhibited by chloride ions and is present in an amount of from about 0.2 to about 5.0 U per strip.

16. A test strip according to Claim 14 wherein the β -HBD is obtained from a source such that it is inhibited by chloride ions and is present in an amount per strip from about 1 to about 100 U per strip.
17. A test strip according to Claim 14 wherein the electron mediator is a diaphorase enzyme.
18. A test strip according to Claim 14 wherein the tetrazolium dye precursor is NBT or INT.
19. A test strip according to Claim 14 wherein ingredient (c) is sodium nitroprusside.
20. A test strip according to Claim 14 wherein ingredient (c) is a diazonium salt.
21. A test strip according to Claim 20 wherein ingredient (c) is 4-nitrobenzene diazonium fluoborate.
22. A test strip according to claim 2 comprising
 - 1) an inert support layer
 - 2) a dried reagent layer comprising a porous material impregnated with:
 - a) NAD
 - b) β -HBD
 - c) a nitroprusside salt or a diazonium salt in a quantity sufficient to react with endogenous acetoacetate in the sample and acetoacetate obtained by conversion thereto of β -hydroxybutyrate in the sample,

- d) and a sufficient quantity of a buffer having a pH from about 8.6 to about 9.5 to maintain the strip at a level of about 8.6 to about 9.5 when saturated with a sample from the group consisting of urine, saliva and sweat.
- 23. A test strip according to Claim 22 wherein the β -HBD is from a source selected from among *Alcaligenes* and others capable of producing β -HBD that is uninhibited by chloride ions and is present in an amount from about 0.2 to about 5.0 U per strip.
- 24. A test strip according to Claim 22 wherein the β -HBD is obtained from a source such that it is inhibited by chloride ions and is present in an amount per strip from about 1 to about 100 U per strip.
- 25. A test strip according to Claim 22 wherein the ingredient (c) is a nitroprusside salt.
- 26. A test strip according to Claim 25 wherein ingredient (c) is sodium nitroprusside.
- 27. A test strip according to Claim 22 wherein ingredient (c) is a diazonium salt.
- 28. A test strip according to Claim 27 wherein ingredient (c) is 4 nitrobenzene diazonium fluoborate.

29. A test strip according to Claim 3 comprising
- 1) an inert support layer and
 - 2) a dried reagent layer comprising
 - a) β -HBD
 - b) NAD
 - c) nitroprusside salt or a diazonium salt in sufficient quantity to
 - (i) immediately react with the acetone present in the sample and stabilize it against volailization
 - (ii) also react with the endogenous acetoacetate in the sample and with acetoacetate obtained by conversion thereto of β -hydroxybutyrate in the sample
 - d) a sufficient quantity of a buffer having a pH from about 8.6 up to about 9.5 to maintain the reaction pH between about 8.6 and about 9.5 when the strip is saturated with sample.

31. A test strip according to Claim 29 wherein the β -HBD is obtained from a source such that it is inhibited by chloride ions and it is present in an amount from 1.0 to about 100 U per strip.
32. A test strip according to Claim 29 in which the salt is a nitroprusside salt.
33. A test strip according to Claim 32 in which the nitroprusside salt is sodium nitroprusside.
34. A test strip according to Claim 29 in which the salt is a diazonium salt.
35. A test strip according to Claim 34 in which the diazonium salt is 4-nitrobenzene diazonium fluoborate.
36. A method for monitoring the level of β -hydroxybutyrate present in a sample of human bodily fluid which comprises contacting a sample of said fluid with a mixture of
 - a) β -HBD which has been obtained from a *Alcaligenes* or another source such that is uninhibited by chloride ions,
 - b) NAD,
 - c) a tetrazolium dye precursor,
 - d) an electron mediator capable of transferring an electron to said dye precursor to effect a color change and
 - e) a buffer having a pH of from about 8.6 to about 9.5,and measuring by electrochemical, spectrophotometric or fluorometric means, or by comparison of the color developed to a preestablished color intensity standard, the amount of β -hydroxybutyrate in the sample.

37. A method according to Claim 36 wherein the tetrazolium dye precursor is NBT or INT.
38. A method according to Claim 36 wherein the electron mediator is a diaphorase enzyme.
39. A method for monitoring the level of combined acetoacetate and β -hydroxybutyrate present in a sample of human bodily fluid which comprises contacting the sample with a mixture comprising the following ingredients:
 - a) β -HBD which has been obtained from *Alcaligenes* or another source such that it is not inhibited by chloride ions,
 - b) NAD,
 - c) a tetrazolium dye precursor,
 - d) an electron mediator capable of transferring an electron to said dye precursor to effect a color change, and
 - e) a buffer having a pH from about 7.0 to about 8.3,and measuring by electrochemical, spectrophotometric or fluorometric means, or by comparison of the color developed to a preestablished color intensity standard, the amount of β -hydroxybutyrate plus acetoacetate present in the sample.
40. A method according to Claim 39 wherein the tetrazolium dye precursor is NBT or INT.
41. A method according to Claim 39 wherein the electron mediator is diaphorase enzyme.

42. A method for monitoring the level of combined β hydroxybutyrate and acetoacetate present in a sample of human bodily fluid which comprise contacting said sample with a mixture comprising the following ingredients:

- a) β -HBD which has been obtained from *Alcaligenes* or another source such that it is not inhibited by chloride ions,
- b) NAD,
- c) a nitroprusside salt of react with endogenous acetoacetate in the sample and acetoacetate obtained by conversion thereto of β -hydroxyrate in the sample, and
- d) a buffer having a pH of from about 8.6 to about 9.5

and measuring by electrochemical, spectrophotometric or fluorometric means, or by comparison of the color developed to a preestablished color intensity standard, the amount of combined acetoacetate and β -hydroxybutyrate in the sample.

43. A method according to Claim 42 wherein ingredient (c) is a nitroprusside salt.

44. A method according to Claim 43 in which the nitroprusside salt is sodium nitroprusside.

45. A method according to Claim 42 wherein ingredient (c) is a diazonium salt.

46. A method according to Claim 45 wherein the diazonium salt is 4-nitrobenzen-diazonium.

47. A method according to Claim 42 having increased sensitivity wherein a tetrazolium dye precursor and an electron mediator are included in the mixture in addition to ingredients (a), (b), (c) and (d).
48. A method according to Claim 47 in which the tetrazolium dye precursor is NBT or INT and the electron mediator is a diaphorase enzyme.
49. A method for monitoring the level of total ketone bodies in a sample of human bodily fluid which comprises contacting said sample with a mixture containing the following ingredients:
 - a) β -HBD which has been obtained from *Alcaligenes* or another source such that it is not inhibited by chloride ions,
 - b) NAD,
 - c) a nitroprusside or diazonium salt in a quantity sufficient to
 - (i) react instantaneously with and stabilize against volatilization the acetone in the sample,
 - (ii) react with endogenous acetoacetate in the sample and
 - (iii) react with acetoacetate formed by conversion thereto to β -hydroxybutyrate in the sample, and
 - d) a buffer having pH of from about 8.6 to about 9.5 and measuring by electrochemical, spectrophotometric or fluorometric means, or by comparison of the color developed to a preestablished color intensity standard, the amount of total ketone bodies in the sample.

50. A method according to Claim 49 wherein & ingredient (c) is a nitroprusside salt.
51. A method according to Claim 50 wherein ingredient (c) is sodium nitroprusside.
52. A method according to Claim 51 wherein ingredient (c) is a diazonium salt.
53. A method according to Claim 52 wherein ingredient (c) is 4-nitrobenzene diazonium fluoborate.
54. A method for monitoring the level of β -hydroxybutyrate present in a sample of human bodily fluid which comprises contacting a sample of said fluid with a mixture containing the following ingredients:
 - a) at least 20 U per milliliter ("ml.") of β -HBD obtained from a source such that it is inhibited by chloride ions,
 - b) NAD,
 - c) a tetrazolium dye precursor,
 - d) an electron mediator capable of transferring an electron to said dye precursor to effect a color change and
 - e) a buffer having a pH of from about 8.6 to 9.5,

and measuring by electrochemical, spectrophotometric or fluorometric means or by comparison of the color developed to a preestablished color intensity standard, the amount of β -hydroxybutyrate in the sample.

55. A method according to Claim 54 wherein the tetrazolium dye precursor is NBT or INT.
 56. A method according to Claim 54 wherein the electron mediator is a diaphorase enzyme.
 57. A method for monitoring the level of combined acetoacetate and β -hydroxybutyrate present in a sample of human bodily fluid which comprises contacting the sample with a mixture comprising the following ingredients:
 - a) at least 20 U per ml of β -HBD which has been obtained from a source such that it is inhibited by chloride ions,
 - b) NAD,
 - c) a tetrazolium dye precursor,
 - d) an electron mediator capable of transferring an electron to said dye precursor to effect a color change and
 - e) a buffer having a pH from about 7.0 to about 8.3,and measuring by electrochemical, spectrophotometric or fluorometric means, or by comparison of the color developed to a preestablished color intensity standard, the amount of acetoacetate plus β -hydroxybutyrate present in the sample.
58. A method according to claim 57 wherein the tetrazolium dye precursor is NBT or INT.
 59. A method according to claim 57 wherein the electron mediator is diaphorase enzyme.

60. A method for monitoring the level of combined β -hydroxybutyrate and acetoacetate present in a sample of human bodily fluid which comprised contacting said sample with a mixture comprising the following ingredients:
- a) at least 20 U per ml. of β -HBD which has been obtained from a source such that it is inhibited by chloride ions,
 - b) NAD,
 - c) a nitroprusside salt or a diazonium salt in an amount sufficient to react with endogenous acetoacetate in the sample and acetoacetate obtained by conversion thereto of β -hydroxybutyrate in the sample, and
 - d) a buffer having a pH of from about 8.6 to about 9.5,
- and measuring by electrochemical, spectrophotometric or fluorometric means, or by comparison of the color developed to a preestablished color intensity standard, the amount of combined acetoacetate and β -hydroxybutyrate present in the sample.
61. A method according to Claim 60 wherein ingredient (c) is a nitroprusside salt.
62. A method according to Claim 61 wherein ingredient (c) is sodium nitroprusside.
63. A method according to Claim 60 wherein ingredient (c) is a diazonium salt.
64. A method according to Claim 63 wherein ingredients (c) is 4-nitrobenzene diazoum fluoborate.

65. A method according to Claim 60 having increased sensitivity wherein a tetrzolium dye precursor and an electron mediator are included in said mixture in addition to ingredients (a), (b), (c) and (d).
66. A method according to Claim 65 wherein the tetrazolium dye precursor is NBT or INT and the electron mediator is a diaphorase enzyme.
67. A method for monitoring the level of total ketone bodies present in a sample of human bodily fluid which comprises contacting said sample with a mixture containing
 - a) at least 20 U per ml. of β -HBD which has been obtained from a source such that it is inhibited by chloride ion,
 - b) NAD,
 - c) a nitroprusside or a diazonium salt in a quantity sufficient to
 - (i) react instantaneously with and stabilize against volatilization the acetone in the sample,
 - (ii) react with endogenous acetoacetate in the sample and
 - (iii) react with acetoacetate formed by conversion thereto of β hydroxybutyrate in the sample, and
 - d) a buffer having a pH of from about 8.6 to about 9.5, and measuring by electrochemical, spectropotometric or fluormoetric means, or by comparison of the color developed to a preexisting color intensity standard, the amount of total ketone bodies in the sample.

68. A method according to Claim 67 wherein ingredient (c) is a nitroprusside slat.
69. A method according to Claim 68 wherein ingredient (c) is a sodium nitroprusside.
70. A method according to Claim 67 wherein ingredient (c) is a diazonium slat.
71. A method according to Claim 70 wherein ingredient (c) is 4-nitrobenzene fluoborate.